The Pending Claims

In compliance with PTO regulations, and to facilitate the examination of this application, Applicants have restated below the pending claims as presently amended.

28. [Amended] A method of producing a cross-over protein that contains at least one peptide segment whose sequence is derived from one parent protein and at least one peptide segment whose sequence is derived from a second parent protein, said method comprising:
ligating under chemoselective chemical ligation conditions (i) at least one N-terminal peptide segment comprising a functional protein module derived from said first parent protein, and (ii) at least one C-terminal peptide segment comprising a functional protein module derived from said second parent protein having an amino acid sequence that is different from said first parent protein, wherein said N-terminal peptide segment and said C-terminal peptide segment comprise compatible reactive groups capable of chemoselective chemical ligation to one another, whereby a covalent bond is formed between said compatible reactive groups of said N-terminal peptide segment and said C-terminal peptide segment so as to produce a chemical ligation product comprising a cross-over protein having a C-terminus and an N-terminus.

29. The method of claim 28 further comprising the step of repeating said ligating one or more times with one or more second peptide segments selected from the group consisting of an N-terminal peptide and a C-terminal peptide segment.

30. The method of claim 28, wherein the first and second parent protein molecules from whose sequences said N-terminal peptide(s) and said C-terminal peptide(s) are derived belong to the same family of protein molecules.

31. The method of claim 28, wherein said chemoselective chemical ligation is selected from the group consisting of native chemical ligation, oxime forming chemical ligation, thioester forming ligation, thioether forming ligation, hydrazone forming ligation, thiazolidine forming ligation, and oxazolidine forming ligation.

32. A method of producing a cross-over protein library whose members contain at least one peptide segment whose sequence is derived from one parent protein and at least one peptide segment whose sequence is derived from a second parent protein, said method comprising:

ligating under chemoselective reaction conditions a plurality of unique N-terminal peptide segments each comprising one or more functional protein modules derived from said first parent protein and a plurality of unique C-terminal peptide segments each comprising one or more functional protein modules derived from a second parent protein having an amino acid sequence that is different from said first parent protein, wherein said N-terminal peptide segments and said C-terminal peptide segments comprise compatible reactive groups capable of chemoselective chemical ligation to one another, whereby a covalent bond is formed between said compatible reactive groups of said N-terminal peptide segments and said C-terminal peptide segments so as to produce a plurality of chemical ligation products comprising a plurality of unique cross-over proteins each having a C-terminus and an N-terminus.

33. The method of claim 32, wherein said plurality of N-terminal peptide segments are obtained by cross-over ligation of two or more different parent protein molecules.

34. The method of claim 32, wherein said plurality of C-terminal peptide segments are obtained by crossover ligation of two or more different parent protein molecules.

35. The method of claim 32, wherein the first and second parent protein molecules from whose sequences said N-terminal peptide(s) and said C-terminal peptide(s) are derived belong to the same family of protein molecules.

36. The method of claim 32, wherein said chemoselective chemical ligation is selected from the group consisting of native chemical ligation, oxime forming chemical ligation, thioester forming ligation, thioether forming ligation, hydrazone forming ligation, thiazolidine forming ligation, and oxazolidine forming ligation.